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namely, the headship in the family group of the oldest male ancestor, whose authority is practically represented by the tribe, and the non-intermarriage of those thus connected.

GEOLOGY AND PALÆONTOLOGY.

THE WATER SHEDS OF THE STATE OF NEW YORK.—The State of New York presents two of the most remarkable water-sheds on the North American continent, if not on the face of the globe. Though situated so near one another that their extremities may be said to almost interlock, they are widely different in their physical features and distribution of water supply. One has been made the mighty servant of man and is harnessed for his bidding, while the other bids defiance, gushing forth its waters at its will, sometimes flooding a vast area of territory, and again leaving its river-beds to dry in the sun.

The most powerful of these is drained by the Oswego river. Its area contains no less than seven thousand square miles of territory. It comprises the well-known chain of lakes, some of which are of considerable size and importance—the Oneida, Cayuga, Seneca, etc., amounting to over four hundred square miles of lake surface. Besides being in themselves natural reservoirs, the State has further improved Seneca lake so as to regulate the periodical flow of the water. The average flow of the water is thus secured at about 600,000 cubic feet per minute. Twenty miles above the mouth of the Oswego river is Three River Point. From this place, down stream, there is a fall of water amounting to seventy-five feet. This space is taken up by seven dams erected and maintained by the State. Of these, two are situated at Oswego, covering a fall of forty feet. These dams accord hydraulic privileges equal to 25,000 horse power. But a moderate outlay is required to keep the flow in the river near the average for the year. 75,000 cubic feet of this water supply are in actual use in Oswego, where a canal is provided for the reception which furnishes fifty runs of first class water and over seventeen of the second class.

Two dams are situated at Fulton with 20,000 horse power. At this point the water privileges are easiest available, although Oswego has the greater representation of industries.

The Oswego River water shed produces clear cold water, which is perfectly under control of man, no matter what the circumstances or exigences. The river bank forms a line teeming with industries, with millions of dollars of money invested. This water supply never endangers the lives of citizens or encroaches on their property, but on the contrary, affords a roadway for inland navigation through the canals which it feeds.

Not so the other subject of this paper. Situated on the highest point in New York, among the Adirondacks, it submits to no governmental check, but ejects its turbid waters, dashing down athwart and over precipices, which in spring time bear before them bridges and valuable property, not to say the lives of mankind.

This water shed covers an area of 2000 square miles. It comprises not less than five hundred little lakes and lakelets, some of which are said to be as large as Cayuga. 4326 feet above the sea level a little lake known as "Tear of the Clouds" starts the Hudson marching onward to the sea.

Here also rise the Moose, Beaver, Oswegatchie, Gross, Raquette, St. Regis, Salmon, Au Sable, Bouquet rivers and many other streams. Could the streams have a uniform flow during the year, the volume of water emitted would be enormous for economic use. But though violent in time of flood they are quite low, not to say often nearly dry, in summer time.

Strange as it may seem, these rivers are scarcely of use as bearing rich deposits for the low land, like the Mississippi, Missouri, etc. The region from whence they emanate is peculiarly hostile to cultivation, and has resented all attempts at settlement and immigration, and gives no return for the careful sowing of seed.

The waters afford few privileges of navigation to the hewer of timber or the excavator of ores in the mountains. They form, however, the fishing ground of America, and yield an abundance of the best of the finny tribe. Its mission in futurity is now foretold as the solving of the problem of water supply to fifty millions of people who may possibly inhabit the Mohawk valley. For the present it is to gratify the pleasurable longings of mankind. The Empire State has, therefore, two grand water sheds, the one for the accumulation of untold wealth and the other for its dissipation. But what is an Empire without unlimited resources?—*W. H. Ballou.*[1]

GEOLOGICAL SURVEY OF NEW ZEALAND.—Dr. Hector's Progress Report for 1878-9, contains a synopsis of the classification of the formations of New Zealand, of which we present a summary: 1. Post-tertiary, including Moa beds, Alluvia and Raised beaches, Moraines, etc. 2. Pliocene, 1500 feet, with three divisions, Terrace plains, Pumice sands and Lignites, Kereru Rotella beds, etc. 3. Upper Miocene, 500 to 1000 feet, including Wanganani beds, Manawatu gorge, Castlepoint, Toerua and Ross, and Waitotara and Awatere beds. In this formation 125 species of Mollusca have been found, of which 120 are found in the existing seas. 4. Lower Miocene, 1000 to 1500 feet, containing 110 extinct marine forms and 55 existing species; divisions two, Mangapokeha valley and the Taipo Awainoa and Pareora beds. 5. Upper Eocene, 500 to 700 feet, with three divisions, Mount

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[1] I acknowledge the valuable assistance of Mr. Chas. Rhodes, a noted lawyer of Oswego, and Prof. Calvin, of the State Survey, in the preparation of this article.

Brown beds, Hutchinson's Quarry beds and Nummulitic beds. Intense volcanic activity prevailed during this period in both islands, and the calcareous strata are frequently interbedded with contemporaneous igneous rocks and tufas, and in the North Island are often replaced by wide-spread trachyte flöes and volcanic breccias. 6. Cretaceo-tertiary, 2000 to 5000 feet, with seven divisions, Gray marls, Ototara and Weka Pass stone, Fucoidal greensands, Amuri limestone, Chalk marls and chalk with flints, Marly greensands, Island sandstone (Reptilian beds) and black grit and coal formation. The marine fossils include, besides well-marked greensand forms such as *Ancyloceras*, *Belemnites* and *Rostellaria*, a number that have still a marked affinity to the Tertiary fauna. Saurian bones occur of the genera *Plesiosaurus*, *Mauisaurus*, *Liodon*, &c., in this part of the formation; but they have only been found as yet over a limited area on the east side of the South Island. 7. Lower Greensand, 500 feet, with two divisions, Amuri group on east coast, Bituminous coals on west coast. 8. Jurassic, 3000 to 5000 feet, with three divisions, Mataura series, Putataka series, and Flag Hill series. The Flag Hill series, which is principally developed in the Hokanui range, Southland, contains fossil plants in its upper beds, which are especially interesting, from at least one species being identical with a plant found in the Ramahal beds of India, which are considered to be of Liassic age, viz: *Macrotæniopteris lata*, with which several others are associated, six of which have been identified. 9. Lias, 2000 feet, with one division, Catlin's river and Bastion series. 10. Trias, 5000 to 8000 feet, with three divisions, Otapiri series, Wairoa series and Oreti series. The Otapiri series is remarkable for the mixed character of its fossils, which, however, contain many forms identical with those from the Rhætic formation of the European Alps. The fossils are chiefly Permian and Triassic forms, but a *Pentacrinus* also occurs, which resembles the Jurassic species. 11. Permian, 6600 to 7000 with one division, the Kaihiku series. 12. Lower Carboniferous and Upper Devonian, 7000 to 10,000 feet, with two divisions, Maitai series and Te Anau series. 13. Lower Devonian, 5000 feet, with one division, the Reefton beds. 14. Upper Silurian, 3000 feet, with the Baton River series. 15. Lower Silurian, 7000 to 10,000, with one division, Mount Arthur series. Below this horizon the quartzite and gneissic granite are found in the mountain ranges.

HILL'S KANSAS EXPLORATIONS.—During the past year Russell S. Hill, of Philadelphia, continued his explorations of the Loup Fork formation of Kansas and Nebraska. He obtained fine specimens of the large mammals discovered last year, especially of *Mastodon campester* and *Aphelops fossiger*, and added representatives of groups not previously known from this horizon. He discovered the pharyngeal bones of Cyprinid fishes, probably of the genus *Alburnops*, also salamanders and *Anura*. There are also

Lacertilia and snakes, some of the latter *Crotalidæ*, as indicated by the characteristic maxillary bone, with its teeth. Specimens of *Procervulus furcatus* with a burr on the horn, show that this species did not differ from *P. necatus* in this respect; also that the *P. ramosus* is distinct from it as a species. In Nebraska Mr. Hill found the Ticholeptus beds containing *Leptauchenia*, etc., occupying the place between the White River and Loup Fork formations already assigned them.

HULKE ON ORNITHOPSIS OF SEELEY.—In the last Quarterly Journal of the Geological Society for 1879, Dr. J. W. Hulke discusses the characters of the huge Saurian named *Ornithopsis hulkei* by Seeley. He identifies with it the *Chondrosteosaurus* of Owen and the *Eucamerotus* of Hulke, but regards the American *Camarasaurus* as distinct. He figures a centrum remarkable for the extent of its lateral excavations, and of more elongate form than the corresponding ones of *Camarasaurus.* He points out the existence of the hyposphen in *Ceteosaurus oxoniensis* and in *Megalosaurus* as figured by Phillips, using for it the term zygosphen, which is, however, homologically a different structure.

FILHOL ON THE FAUNA OF ST. GERAND LE PUY.—The region of the Allier, Puy de Dome and Haut Loire, has for years furnished beautiful specimens of extinct vertebrates to the geologists of France, beginning with the time of Cuvier and De Blainville. Dr. Filhol has recently reviewed the work hitherto done in this field, and with the aid of much new material, which includes that obtained by Dr. Alphonse Milne Edwards, has commenced the publication of a detailed monograph. The first part, issued in the Annales des Sciences Geologiques, contains descriptions and figures of three species of *Chiroptera*, one of *Insectivora*, four of *Rodentia*, twenty-six of *Carnivora*, and five of *Artiodactyla.* The elucidation of this fauna is of interest to American palæontologists, since it corresponds approximately in time with the Truckee or Oregon division of our White River fauna. The faunal differences are as numerous as the resemblances. In France *Canidæ* abound, but they are mostly *Amphicyons*, not *Canis* nor other genera found in Oregon. Weasels are much more numerous than in America. There is a near affinity between Filhol's genus *Procælurus* and our *Archælurus*, though the two are distinct. Other forms of *Felidæ* are not recorded. The *Artiodactyla* are *Cænotheria*, which are abundant in species and individuals. The fullness of M. Filhol's descriptions makes them of much value to science, and the light he throws on questions of synonymy is an important acquisition. We can only wish that he could consult euphony more frequently in the construction of new generic names.

NOTES ON SABRE-TOOTHS.—The large species described in the December number of this Journal as *Hoplophoneus platycopis* turns out to belong to a new genus, which has a premolar tooth additional to the number usual in sabre-tooths. It agrees with *Dinictis* in this respect, and in its formula Pm. $\frac{3}{3}$, M. $\frac{1}{1}$, with that I assigned to *Daptophilus*. The latter however appears to have been based on an immature *Dinictis*. The new genus may be called *Pogonodon*.

Nearly the smallest of the Oregon sabre-tooths is probably undescribed. It is represented by the greater part of a skull with parts of all the teeth of one side. Its brain case is relatively large, and the sagittal crest small; the occiput is wide and vertical. Postorbital process robust and prominent; mastoid and glenoid processes elongate. There is but one, a small premolar in front of the sectorial, and it has a very prominent heel. The sectorial has a prominent anterior lobe, showing that the species is probably a true *Machærodus*. The tubercular is very small. The canines are relatively very large; their crowns are not preserved. The front is slightly protuberant on each side of the middle line and then descends steeply to the orbit; sagittal crest horizontal. Length of cranium (axial) M. 0.120; from muzzle to orbit .045; vertical diameter of orbit .025. Long diameter of canine .015; length of diastema .011; of premolar .006; of sectorial .015; width between posterior external angles of sectorials .056. The species may be called *Machærodus cerebralis*.—*E. D. Cope.*

GEOGRAPHY AND TRAVELS.[1]

AFRICAN EXPLORATION.—The *Henry Venn*, a steamer belonging to the English Church Missionary Society, started from Lukoja, at the mouth of the Benué, on July 8, 1879, to ascend that stream as far as practicable.——The *Academy* notices a two years' exploration of the river Gambia, made by Mr. Frederic Speer, in the course of which he penetrated higher up the stream than any European had ever done before. Though unable to take observations, he has taken compass bearings and laid down the upper course of the stream with considerable accuracy. He thinks British traders would be able without much difficulty to establish a valuable trade with Timbuktu and the upper Niger. A similar report is made from the upper Volta, which was visited recently by M. Buss, a missionary, who met with a friendly reception at Salaga, the chief town of that region, containing about 50,000 inhabitants.——Herr Schütt, whose explorations in Central Africa were noticed in our number for May, 1879, has returned to Europe with large natural history collections and carefully drawn maps of the region traversed by him, which included a large tract of hitherto unknown country between the Kwango and the Kassai rivers, or between about 18° and 22° E. longitude, part of which is under the rule of the famous Mwata Yanvo. He has made some important discoveries concerning the intricate hydro-

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[1] Edited by ELLIS H. YARNALL, Philadelphia.